Broadband Research Report

A collection of stories published by the Daily Yonder

About the authors

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Funding for this study was provided by the National Agricultural and Rural Development Policy Center (NARDeP).

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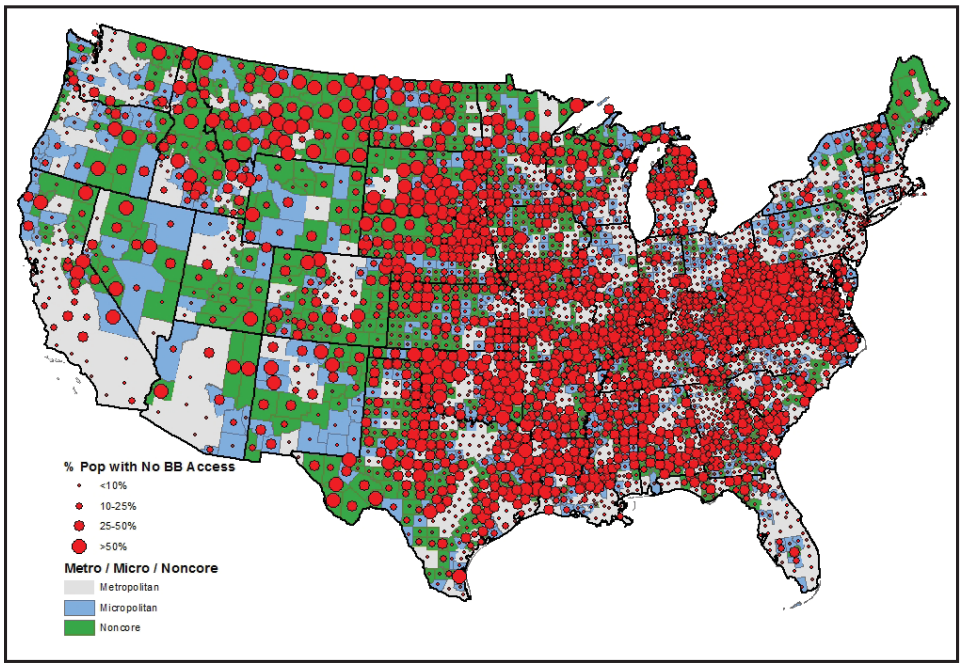
PART I:

Broadband Availability: Geography Matters

By Brian Whitacre, Roberto Gallardo, and Sharon Strover



Source: National Broadband Map Data aggregated to County Level, 2010
Figure 1. Percentage of Population with No Wired Broadband Availability, by Metropolitan Status (2010). The size of the red dots indicates the percentage of a county's population that lacks wired broadband. The larger the dot, the greater the percentage of the population that lacks service.

Regular readers of the Yonder are used to seeing stories about the importance of broadband access for rural residents. They are also familiar with stories about difficulties in obtaining a reliable broadband connection in rural areas. However, for a long time, there was very little data on exactly where broadband was and was not available across the country.

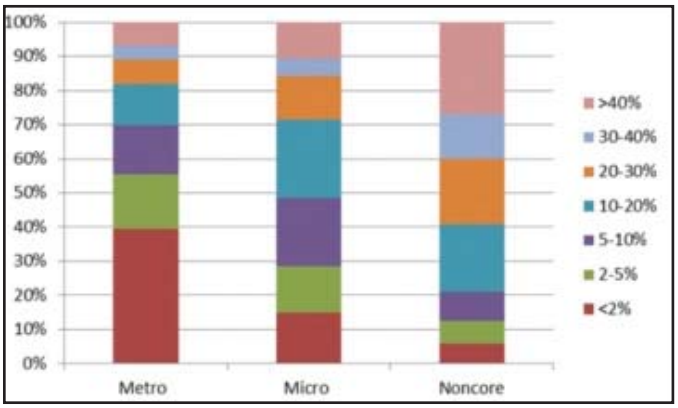
The National Broadband Map came along in 2010 and provided the first, low-level look at exactly what parts of the country had access to broadband connections. The map provided broadband-related information for each Census Block (of which there are around 8 million in the United States),

including the number of providers, advertised download / upload speeds, and technology utilized. You can check out the map here and see what it has to say about where you reside.

The initial 2010 dataset contained a unique variable – the percentage of the population in each Census Block for which no "wired" broadband infrastructure was available. The definition used for broadband (3 mbps download, 768 kbps upload) is slightly lower than the current Federal Communications Commission (FCC) definition (4 mbps down, 1 mbps up), but is still a useful measure for determining gaps in availability. The official report from the FCC (see Table 2 on page 29) associated with this initial version of the map suggested a striking gap between rural and urban availability: 23.7% of rural residents lacked this type of access, compared with only 1.8% of non-rural (i.e. urban) residents. (It is worth noting that the picture of broadband availability painted by only the "wired" infrastructure is much different than when "wireless" is also considered – a fact that has been pointed out by other Yonder articles).

When the Census Block data is aggregated to the county level (which allows for breakouts of different levels of rurality) and mapped, it becomes apparent that broadband availability varies greatly across the country. (See the map at the top of this article.)

Clearly, some states have large portions of their populations that still lack access to wired broadband infrastructure. West Virginia, South Dakota, and Oklahoma look particularly poor. Not surprisingly, most of the metropolitan counties in the map have the smallest dots -- meaning that most of their population does have access to relatively high levels of broadband infrastructure. Similar trends have been noted for broadband speeds.



Source: National Broadband Map Data aggregated to County Level, 2010. Figure 2. Proportion of Counties Meeting No Broadband Availability Thresholds (by metropolitan status), 2010. The graph shows that the availability of broadband decreases for counties as they move from metropolitan (generally, counties with cities of 50,000 residents and up), micropolitan (counties with cities of 10,000 to fewer than 50,000) and noncore (counties that have no cities of more than 10,000 residents).

We can also look at general levels of broadband availability across the three types of counties: metro (which typically have a city of 50,000 or more), micro (which typically have a city of 10,000 or more), and non-core (no cities of 10,000 or more). The figure to the left demonstrates that the more rural areas are significantly worse off in terms of the availability of wired broadband infrastructure. In fact, nearly 30% of all noncore counties have more than 40% of their population lacking access to wired broadband infrastructure. Alternatively, we can look at where broadband availability is best -- where less than 2% of the county population lacks access. Only 5% of non-core counties meet this highest category of availability, compared to nearly 40% of metro counties.

In some states, the availability gap is not all that great; in others it is significant. Some large metro – noncore gaps are found in larger, relatively rural states where it might be expected (South Dakota, Idaho, Montana, Alaska), but others are found in smaller states (Maryland and Louisiana). There are only a handful states where the metro – noncore availability gap is in the single digits (South Carolina, Pennsylvania, Massachusetts, and Maine).

Of course, availability of broadband infrastructure is only the first piece of the puzzle. Adoption rates and how the technology is used greatly affect the potential for economic and societal gains.

The authors of this article have put together a comprehensive look at the broadband situation in rural America, including availability and adoption trends over time, impacts to the rural economy, and policy prescriptions. Over the next several weeks, they will break down their most important findings and attempt to move the rural broadband conversation forward.

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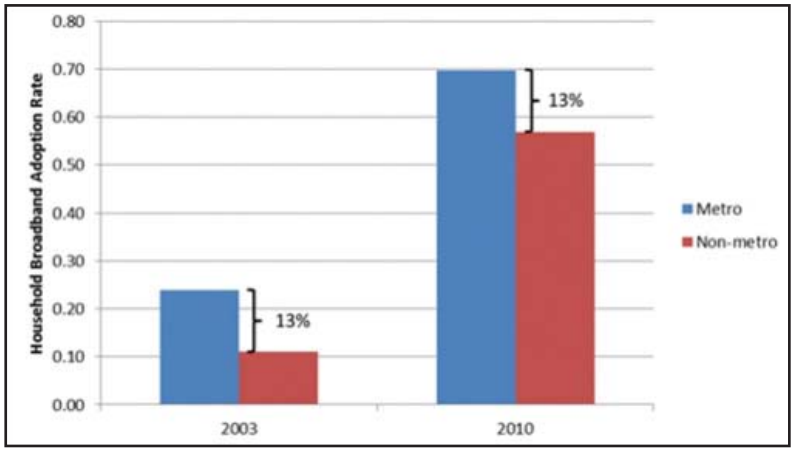
PART II:
Digital Gap Widens for Rural Elderly, Poor

By Brian Whitacre, Roberto Gallardo, and Sharon Strover

Rates of residential broadband adoption have grown considerably between 2003 and 2010. Overall adoption rates have more than tripled from around 20% in 2003 to over 65% in 2010. Interestingly, the overall "digital divide" between rural and urban households (technically designated as metro vs. nonmetro below) has remained consistent over this period at around 13 percentage points.

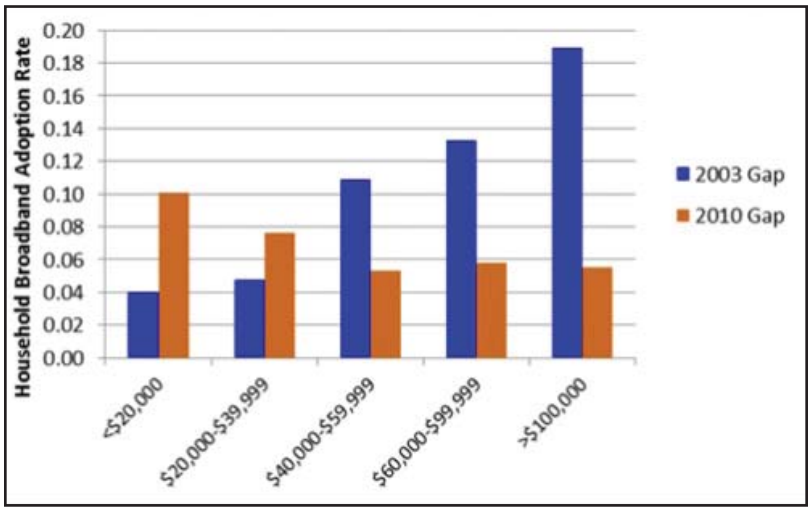
So, not a lot of progress has been made in closing the metro/nonmetro broadband gap. Perhaps more interesting, however, are the changes in the gap over time among particular demographic groups. In particular, the metro/nonmetro gap has actually increased over time for households with characteristics that



Source: Current Population Survey Internet Use Supplement, 2003 and 2010
Figure 1. Household Broadband Adoption Rates by Metro/Nonmetro Status, 2003 and 2010. The gap in adoption rates of broadband between metro and nonmetro residents remained steady at about 13 percentage points from 2003 to 2010.

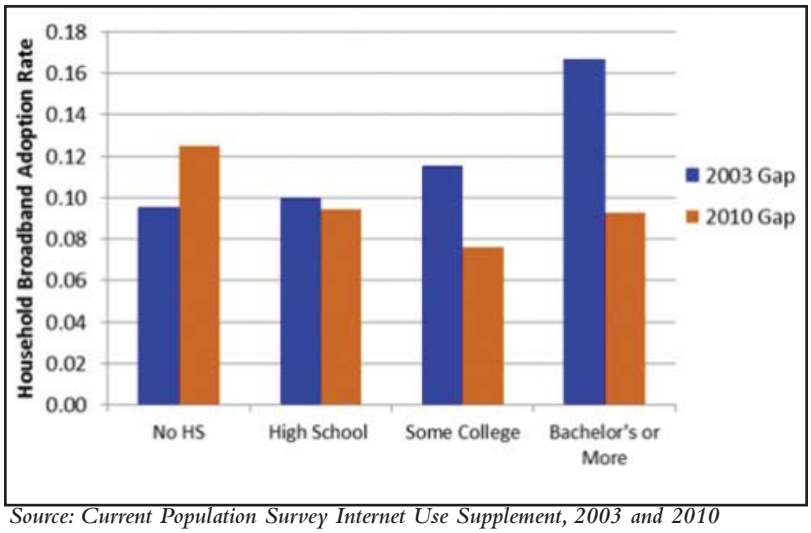
have historically been associated with low levels of broadband adoption (low income, low education and elderly).

The figures below show the metro/nonmetro gaps in broadband adoption rates for various income and education levels in both 2003 and 2010. Adoption rates for all households increased over this time. However, the metro/nonmetro gap has in fact gotten larger in some cases – suggesting that rural households are now even further behind their urban counterparts than they originally were in 2003. In particular, the metro/nonmetro gap for households with lower income levels (less than $40,000) is actually larger in 2010 than it was in 2003. While the gap for higher-income households has decreased, these lower income residences seem to be losing ground in rural America – at least in terms of broadband adoption.



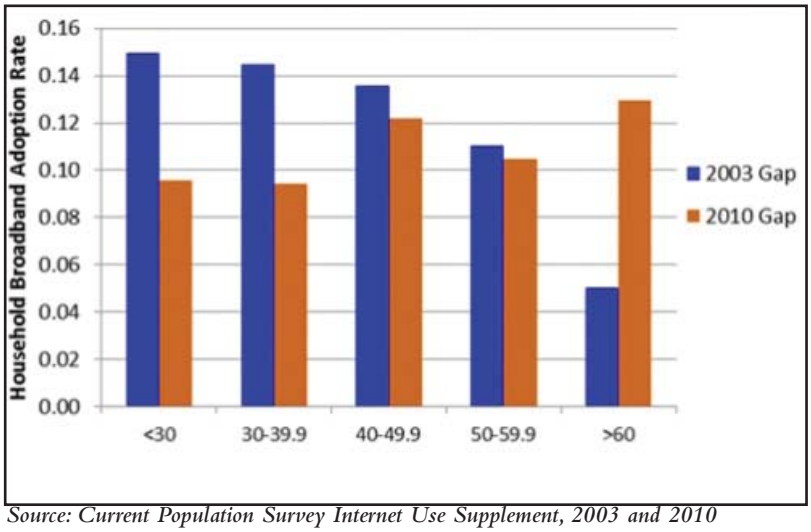
Source: Current Population Survey Internet Use Supplement, 2003 and 2010
Figure 2. Metro/Nonmetro Broadband Adoption Gap by Income, 2003 and 2010. The metro/nonmetro gap in broadband adoption increased for households earning less than $40,000. For households earning more than $40,000 the gap decreased.

Similarly, the metro/nonmetro gap for households headed by an individual with a less than a high school degree was larger in 2010 than it was in 2003. The gap shrunk for households headed by someone with more than a high school diploma, but again, less-educated individuals in rural areas are falling further behind.



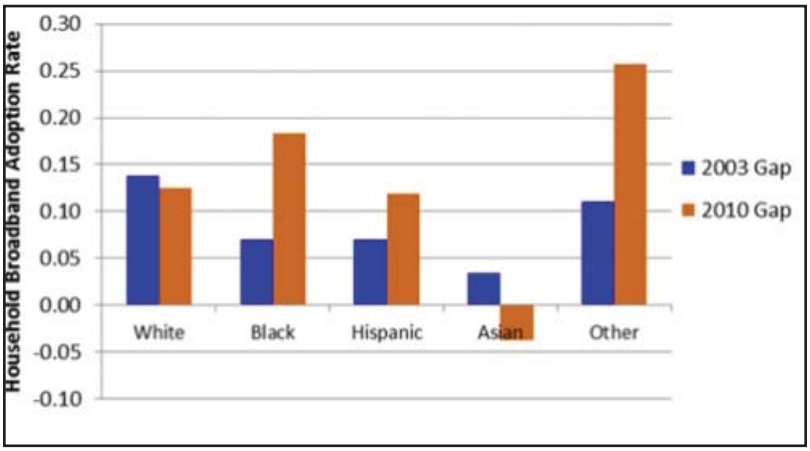
Source: Current Population Survey Internet Use Supplement, 2003 and 2010
Figure 3. Metro/Nonmetro Broadband Adoption Gap by Education, 2003 and 2010. The metro/nonmetro broadband adoption rate gap increased for residents with less than a high school diploma. For groups with higher education levels, the gap fell.

A similar story can be told about another important predictor of Internet adoption – the age of the head of household. Figure 4 demonstrates that older heads of households (ages 60 and older) in metropolitan areas increased their broadband adoption rates between 2003 and 2010 at a faster rate than their non-metropolitan counterparts. This means that another group of historically slow broadband adopters – the elderly – are seeing the metro/nonmetro broadband gap increase rather than decrease.



Source: Current Population Survey Internet Use Supplement, 2003 and 2010
Figure 4. Metro/Nonmetro Broadband Adoption Gap by Age, 2003 and 2010. The metro/nonmetro adoption gap grew significantly for people over 60 years of age. For younger groups, the gap fell.

This trend of increasing metro/nonmetro broadband gaps over time for specific demographic groups continues along racial and ethnic lines. Figure 5 demonstrates that for minority categories such as black, Hispanic, and other race, the metro/nonmetro gaps are larger in 2010 than they were in 2003. The metro/nonmetro gap for whites was relatively consistent in both years, while Asian households actually had higher broadband adoption rates in nonmetro areas in 2010 (and thus had a "negative" gap).



Source: Current Population Survey Internet Use Supplement, 2003 and 2010
Figure 5. Metro/Nonmetro Broadband Adoption Gap by Race, 2003 and 2010. The metro/nonmetro broadband adoption gap grew for all races except whites and Asians.

Conclusion

There has been a lot of discussion recently about rising income inequality and diminishing "equality of opportunity" in the United States. Effective use of broadband Internet certainly has the potential to increase economic mobility for some historically disadvantaged groups – but only if these households are introduced to the possibilities the technology presents. In rural areas, in particular, broadband holds a world of opportunities for income generation (examples here and here) and improving education (examples here and here). The statistics presented in this article, however, are cause for concern. Historically disadvantaged groups in rural areas seem to be falling further behind in broadband adoption, which can make the situation even worse.

So, while most government policies dealing with broadband have traditionally focused exclusively on providing infrastructure (such as grants or loans to telecommunication companies), there is a case to be made for attempting to increase demand. Economists have been making this case for a while. In particular, the much ballyhooed $7.2 billion broadband component of the American Reinvestment and Recovery Act only put about 3.5% of those funds toward encouraging sustainable adoption. Programs that help educate rural citizens about the opportunities that broadband presents are a useful complement to investments in the infrastructure itself – and likely deserve a bigger chunk of the pie.

(The next article in this series will focus on what the evidence says about broadband's impact on the economic health of rural areas.)

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PART III:
Broadband's Economic Impact

By Brian Whitacre, Roberto Gallardo, and Sharon Strover

Much has been made about the potential benefits of broadband for rural communities. There are plenty of examples relating to education, health, telecommuting, entrepreneurship and e-services that suggest broadband can be a panacea for rural economies.

But since broadband has been around for a while now, what can we really say about the impact it has had on rural areas? Is it really true that rural areas that have embraced broadband are growing faster, have lower levels of unemployment or have more businesses or firms than those that have not?

To get an answer, we looked at all non-metropolitan counties across the country. The FCC has some great data sets that tell us, at the county level, the percentage of households that have a broadband connection (note that these only include wired connections, and meet the traditional FCC definition of broadband of 200kbps in at least one direction). Using data from 2010, we put all non-metro counties into categories from the lowest-adopting (with rates of less than 20%) to the highest-adopting (more than 80%), and compared them in terms of their 2010 median household income, education levels, number of firms, poverty rates and unemployment rates. Here is what we found:

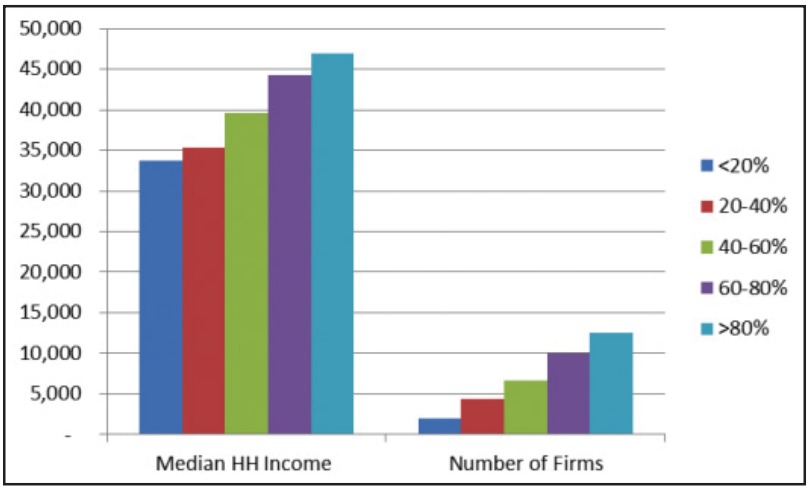

Figure 1. Median Household Income and Number of Firms for Non-metro Counties, by Broadband Adoption Category, 2010.

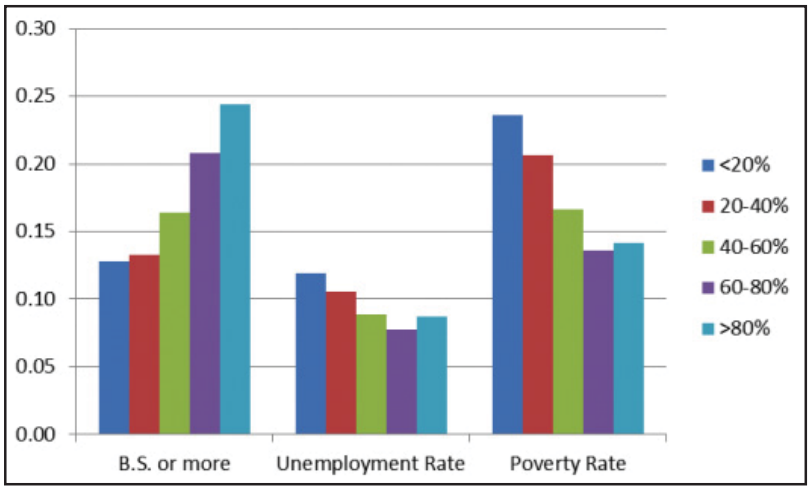

Figure 2. Education, Unemployment Rate, and Poverty Rate for Non-metro Counties, by Broadband Adoption Category, 2010.

Clearly, the non-metro counties with the highest levels of adoption are doing great – they have the highest levels of income and education, have more firms and have relatively low unemployment and poverty rates. The non-metro counties with the lowest adoption rates are doing the worst.

However, correlation does not necessarily imply causation. In other words, it might be true that counties have higher levels of broadband adoption because of their higher incomes or higher education levels, and not the other way around.

To attempt to account for this, economists use several techniques. One of the more popular ones is to use county characteristics (education, income, age, race) before broadband was even available (i.e. during the 1990s or around 2000) to predict the likelihood of that county ultimately obtaining high levels of broadband adoption. Some of the predictions turn out to be true, and some don't. But the neat part is that you are left with two groups of non-metro counties that had similar characteristics before broadband was even available. One of the groups impressively adopted broadband after that time, and the other did not. Comparing growth rates between these two groups can tell us what impact (if any) broadband had.

Once this is done, and we compare these "otherwise similar" communities, can we make the claim that high (or low) levels of broadband adoption actually cause certain types of economic growth? Our latest research says yes, in the following cases:

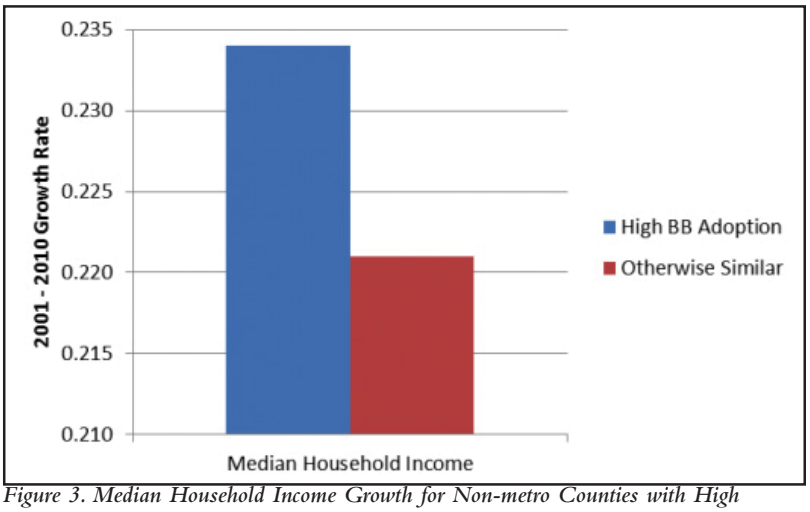

Figure 3. Median Household Income Growth for Non-metro Counties with High Broadband Adoption (>60%) and Otherwise Similar Counties, 2001-2010.

As shown in the graph above, non-metro counties that had high levels of broadband adoption (greater than 60%) in 2010 had significantly higher growth in median household income – 23.4% versus a little over 22% – between 2001 and 2010 when compared to counties that had similar characteristics in

the 1990s but were not as successful at adopting broadband.

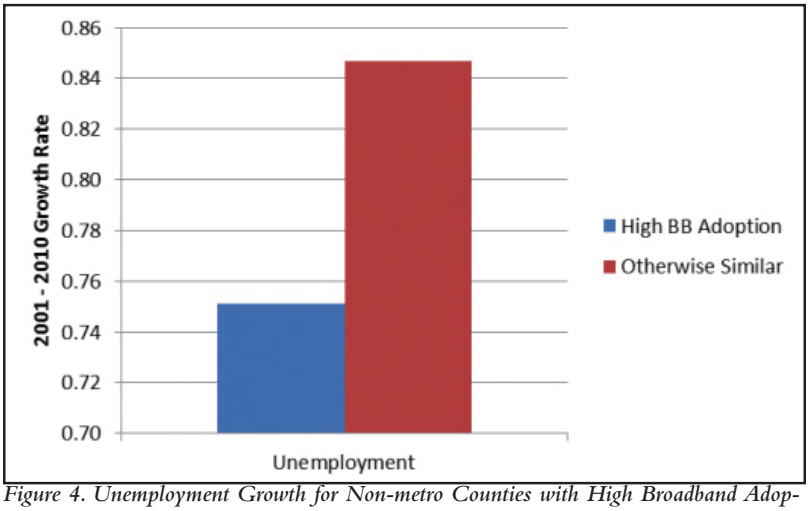

Figure 4. Unemployment Growth for Non-metro Counties with High Broadband Adoption (>60%) and Otherwise Similar Counties, 2001-2010.

Similarly, the unemployment rates of these high-adopting counties increased at a much slower rate during the 2000s – 75% versus a little over 84% – as shown in the graph above. (Note that nearly all counties had higher unemployment rates over this time due to the recession.)

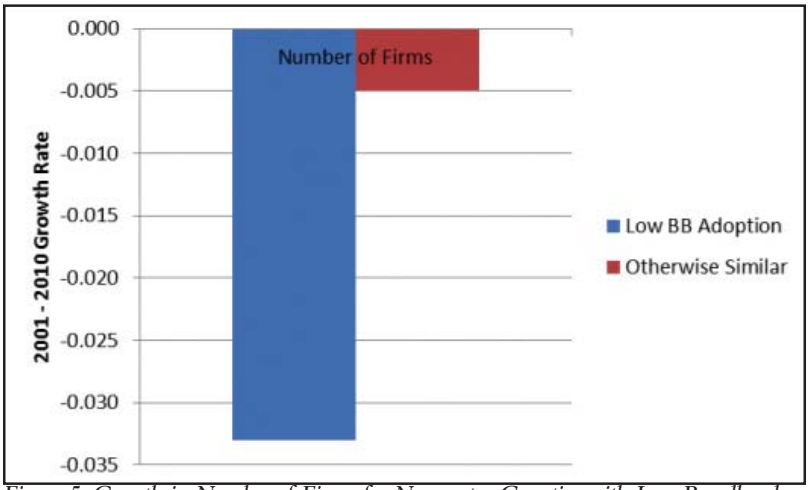

Figure 5. Growth in Number of Firms for Non-metro Counties with Low Broadband Adoption (<40%) and Otherwise Similar Counties, 2001-2010.

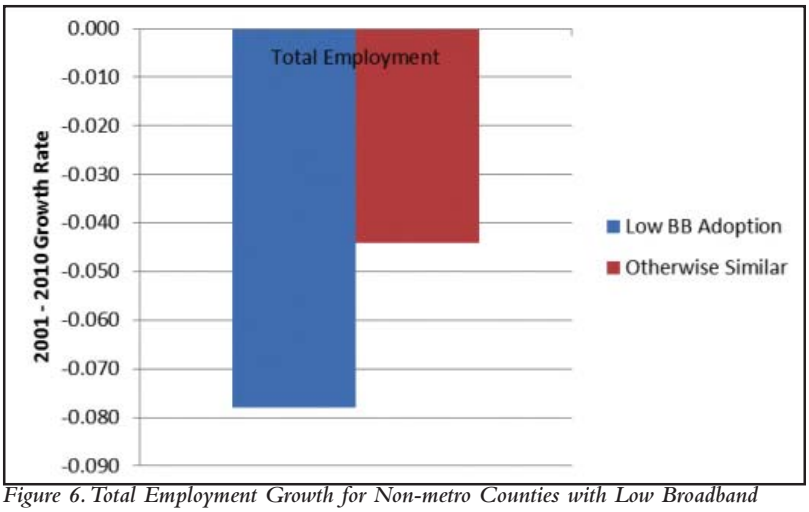

Figure 6. Total Employment Growth for Non-metro Counties with Low Broadband Adoption (<40%) and Otherwise Similar Counties, 2001-2010.

We also found that counties that had relatively low broadband adoption rates (less than 40%) had lower growth in both the number of firms and total employment than did counties with similar 1990 / 2000 characteristics but higher adoption rates as of 2010. (Again, most non-metro counties lost firms and employment over this time).

Interestingly, when we repeated this analysis for levels of broadband availability (versus adoption), there were almost no results to report. The only positive result was that when very high download speeds were available (greater than 10mbps), the growth in creative class employment between 2001 and 2010 was larger. All other measures related to simply providing broadband showed no significant differences between the two groups of counties.

These results tie back to our suggestion from the previous article in this series that government policies dealing with rural broadband may need to have a more explicit focus on actually adopting (and effectively using) the technology. The traditional focus of these programs on simply providing infrastructure may not be enough to encourage true economic growth.

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